the basis of body colour (yellow eel, silver eel and intermediate). The whole sample (on which total length, weight, pectoral fin length, vertical and horizontal eye diameter was measured) has been randomly split into a model sample and a test sample representing 50% each of the dataset. A subsample of 229 individuals has been also sacrificed in order to determine liver and gut weights and to collect otholits for the age evaluation. A good discriminant model was obtained for both datasets: the first analysis, using five variables, shows a correct classification of 78 %, the latter, with eight input variables, 79,8 %.

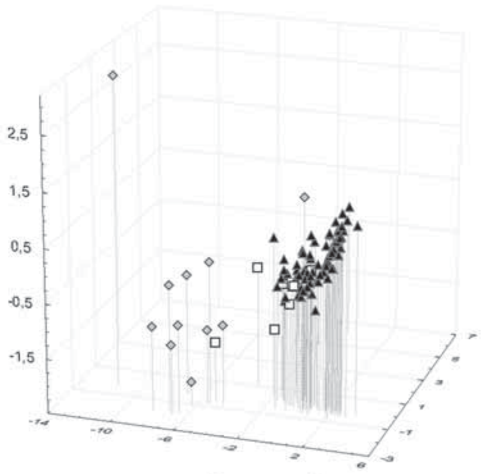

Figure 1. Ordination pattern of test sample. LVs are latent vectors with their variance.

Each sample has been represented using three latent variables, explaining 98,3 % and 94,3% of total variance for the whole sample and subsample, respectively.

3. Conclusions

A comprehensible and easy classification of silvering stages is of importance for field studies and it is therefore a useful tool when conservation and management strategies need to be defined.

This study confirms that a classification on the basis of body colour is a simple and reliable method to characterize European eel stages. Moreover this model obtains a good percentage of classification, based only on the use of external parameters, hence avoiding animal sacrifice.

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LOW COMPLEX OFDM-CDMA BASED WIRELESS SENSOR NETWORK IN THE HF BAND: DOWNLINK

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1. Introduction

An OFDM-CDMA (Orthogonal Frequency Division Multiplexing - Code Division Multiple Access) based system proposal working in the HF (High Frequency) band is presented for a downlink channel. The system could be developed to fit into WSNs (Wireless Sensor Networks). We rather propose a prototype; a further is required to perfectly define all parameters. There are different reasons to develop a new digital communication environment that can be integrated in a WSN. In a WSN having a node working as a BS (Base Station), this node should These nodes will be called MS (Mobile Setation) even if they are not in mobile.

The first reason to develop this project is that modern communication systems digitally implement not only low-pass signals but also IF (Intermediate Frequency) signals. Very fast and low-cost AD/DA (Analog-to-Digital / Digitalto- Analog) converters exist in the market that can sample the HF band. We realize that, in the HF band, one can digitally construct signal to directly connect the amplifier from the DA. Digital technology can be applied to constructing almost all HD transceivers, and the RF (Radio Frequency) subsystem is reduced to an amplifier and an antenna. In the HF band one can digitally do filters, rough synchronization, base band conversion, fine synchronization, channel equalization, demodulation and decoding processes. Modern FPFA (Field Programmable Gate Arrays) provide hardware resources to build the transceivers.

The HF band provides very good propagation conditions. In this band, space losses are lower than in higher bands. The diffraction dominating in this band usually extends the area to cover beyond the direct light of signal.

This paper is one of two papers and it deals with a downlink strategy. or Sensor Network Topologies having a central node working as a BS, we propose the OFDM-CDMA modulation. BSs can usually work without hard power limitations. Since the OFDM-CDMA transmits a continuous flow of data, the BS can insert known data to help the nodes to extract time and frequency references for synchronization and for channel equalization.

The first works combining OFDM with different multiple access techniques appeared in 1993 [1-5].The OFDM-DCMA was one of these approaches. The use of OFDM-DCMA in the HF band was applied in [6]. Our approach combines the OFDM-CDMA in the in the downlink and an OFDM-TDMA burst system in the uplink for obtaining low cost transceivers, especially for MSs nodes. We look for simplicity and low-cost implementations.

Figure 1 represents data from the BS to the MS (or sensor nodes) in time and frequency axes.

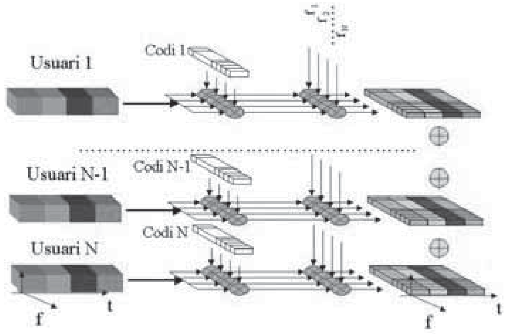

Fig. 1

Figure 1.
Downlink representation where Base Station synchronize the information for N sensor elements, spreading each symbol by a code and module each bin-code on a subcarrier. All subcarriers transmit information to all sensors. The receiver, using its particular code, can recover its information.

The existing HF modem described by MILSTD-II8-11OA standard is a single tone modem which is able follows fast channel's changes. The performance of this modem can be compared to that of ours OFDM-CDMA modem in the downlink. A more interesting implementation can be found in [6] where an OFDM-CDMA modem, with sampling rate of 9600 Hz and 73 subcarriers, uses a bandwidth of 2700 KHz. This system has 60 information subcarriers, and 13 of them are used to carry pilot symbols for the channel estimation; a QPSK modulation is applied and is used for channel codification channel coding the Reed Solomon scheme (15/9) providing error protection. The symbol duration is approximately of 30ms.

2. Objective

Our objective goal is to parametrize all these designs and to develop a method for downloading the prototypes to the Nallatech platform. Further, we can take field measures under real conditions with real channels. Once the process is completed, modifications can be introduced easily by modifying some block parameters. After that the system can quickly be adapted to different kinds of channels, or different data rates, or limited power consumption. Crucial parameters such as bandwidth, cyclic prefix length, number or subcarriers, and the type of modulations, can be optimized depending on the channel and operation conditions.[7-8]

3. Conclusions

We suppose that the WSN has a cellular structure. The reason for suggesting the OFDMCDMA technology is the advantage that this multiple access strategy offers in the down-link channel. This is, the link from the BS (Base Station) to MS (Mobile Stations) or sensor point. We first we the only suppose one BS and some sensors spread around the BS. MSs can be or not, any way we call them MSs.

In most wireless sensor networks the BS has no low-power limitations which could be used in the down-link to send a synchronous signal formed by OFDM symbols. These symbols have to be extended using cyclic prefixes. Cyclic prefixes avoid ISI (Inter Symbol Interference) and ICI (Inter Carrier Interference). Some of this symbols regularly provide some known dada to help the MS to obtain time and frequency synchronization and to provide support to channel equalization. Introduction of known dada or pilot symbols enables the system to operate with low-complex receivers. In the OFDM-DCMA, multiple access is performed using WH (Walsh Hadamard) codes that are orthogonal between them. The MAI (Multiple Access Interference) is avoided only in the downlink.

The OFDM-DCMA modulations do not have the same good properties in the uplink. It is very difficult to obtain a perfect synchronization between the different MSs signals in the uplink. This means that WH codes are not perfectly aligned, and MAI appears. A further paper will deal with a strategy to be used in the uplink.

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PHOTONIC TECHNOLOGIES FOR NON-INVASIVE SEXUAL IDENTIFICATION: THE CASE STUDY OF SALAMANDRINA PERSPICILLATA (AMPHIBIA, URODELA)

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1. Introduction

The genus Salamandrina (Fitzinger, 1826) is unique to peninsular Italy. S. perspicillata (Savi, 1821) occurs in north and central Italy. There are no external sexual characters which permit to sex individuals. However, there are statistical biometric differences between male and females samples [1]. Further, one can sex females since these are the only that enter in water (during oviposition). In this contribution we report the results of three different techniques used to assess the sex of 21 unsexed individuals, presumed males (i.e., those that in successive years we never recorded in water) in comparison to a sample of 21 females: Termography, Spectral imaging and Biometric comparison.

2. Results and Discussion

Termography - Thermal images of 21 couples of animals (female / unkwnon, presumed male) were filmed with a thermocamera (Flir Systems S40, thermal sensitivity 0.08 °C) inside a box, after 1 hour of thermalization at constant room condition (20 °C, 50 % RH). Through the thermal image software (ThermaCAM Researcher Pro 2.7), the minimum, the maximum and the mean temperatures of three ROI (Region Of Interest) were extracted from head, trunk and vent body regions. Total infrared radiance was transformed in temperature [2] using a emissivity value of 0.97 (established with a specific test). The differences between females and presumed males (an example in figure 1) were tested by means of repeated measures ANOVA for each body region.